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Good and Bad Publicity

The gossip column, "By the Way," of the Sheffield evening paper *The Star*, carried under the caption "Foundry Apprentices" the following paragraph: "Nineteen apprentices in their best suits and with their hair well brushed were on their best behaviour when they sat down to a 'slap-up dinner' at the Royal Victoria Hotel, Sheffield. The occasion was the annual dinner of the Sheffield and District branch of the Institute of British Foundrymen. Over 400 were present—many of them highly-skilled—and the boys were the guests of their company, the Renishaw Iron Company." Last year, there was news that F. H. Lloyd & Company, Limited, were arranging to send one of their boys to America for a period as an integral part of their apprenticeship scheme.

These activities are obviously very good propaganda for the recruitment of youth into our industry. Mr. R. F. Horton, the president of the Sheffield branch, in his reply to a toast, stressed the great importance of this question by referring to the Russian plan for training four million technologists during the next five years. The British Government is equally alive to the question; there is much evidence of a scramble for the enrolment of youth by the various industries and the foundry industry needs all the helpful propaganda it can get. Yet it is wise to remember that much good work can be nullified by lack of imagination and unintelligent gossip.

We did not see the recent television programme covering the casting of bells, but it appears that prominence was given to the incorporation of horse-manure in the sand mixture. This gave, especially to the womenfolk who formed much of the gigantic audience, a feeling of nausea or "the creeps," as one lady put it to us. It is axiomatic that the mother's influence is very great when the choice of a career for her son is under consideration. All the propaganda based on the fact that horse-manure is very seldom used—and never by the largest concerns—or that as a raw material it is unnecessary and can without detriment be superseded by more salubrious material has been largely birth-strangled by this broadcast. We ask readers, when dealing with the agents of lay publicity, to remember that such people seldom have the interests of our industry at heart, but are merely searching for incidents capable of arresting the attention of the reader, listener, or viewer. Thus it is as well, when encountering such situations, to bear in mind the long-term effects on the whole industry, for it is better to have no, rather than adverse, publicity.

Owing to a continuance of the dispute in the printing industry, this issue of the JOURNAL is below normal size and apologies are again tendered to readers and advertisers.

Meetings for Apprentices

The special apprentice meeting organized last October by the Bristol & West of England branch of the Institute of British Foundrymen proved such a success that it has been decided to hold a further meeting on March 10. This will be held at the College of Technology, Bristol, at 11 a.m., and the following films will be shown: "Mechanization in Coremaking"; "Casting in Iron"; "Moulding a Part with a Vertical Core"; and "Making a Master Pattern and Corebox for a Water-cooled Motor Block." It is hoped to entertain the apprentices to luncheon following the meeting, as was done on the previous occasion.

A special meeting for apprentices in the current session has also been arranged by the London branch of the Institute, to which apprentices from works within the London area, particularly those in foundries, are invited. The idea is to continue the friendly association between apprentices and the London branch which started with the Foundry Apprentice Competition organized last year. The meeting will be addressed by Mr. A. Talbot, of Western Foundries, Southall, and other foundry experts will be present. Patterns, coreboxes and castings used and made in the Competition, will be on view, as well as others which may have special interest or problems for apprentices. The meeting, to be held at the Waldorf Hotel on April 11 at 7.30 p.m., will be informal and questions and comments will be welcomed from the audience.

Sheffield IBF Dinner

Mr. R. F. Horton, on January 3, presided over the annual dinner of the Sheffield and district branch of the Institute of British Foundrymen, which was held at the Royal Victoria Hotel. It was the largest social gathering ever held as a branch function and attracted no fewer than 415 participants. Moreover, this was an all-male gathering, but was carried through in such a quiet dignified way that it would have met the approbation of a bunch of lady churchworkers. Indeed the Church was well represented by the Lord Bishop of Sheffield and one of his colleagues from Eckington. At the high table was a noteworthy assembly of the leaders of both the iron and steel industry, represented by Sir Ernest Lever and Dr. H. H. Burton, C.B.E., and the foundry industry. Here there were Mr. F. N. Lloyd; Dr. A. B. Everest; Sir Harold West; Mr. W. T. Hobkirk; Mr. L. K. Everitt; Mr. V. C. Faulkner; Mr. M. A. Fiennes; Mr. Ambrose Firth; Mr. R. C. Heys; Mr. F. A. Hurst; Mr. G. Lambert; Mr. W. D. Pugh; Mr. H. W. Secker; and Mr. T. Watson. The organization of the dinner was carried through by Mr. John Bolton who, when acting secretary of the Institute, gained a wealth of experience in such matters. He had replaced Mr. J. H. Pearce who has recently undergone a surgical operation, but was sufficiently recovered to be present.

IN THE ISSUE of the FOUNDRY TRADE JOURNAL for February, 1915, there was an editorial discussion of the question of buying pig-iron on its composition rather than by fracture. In the Editor's judgment, the period —in the middle of the great war—was not opportune for a major change. It is pleasing to note that by then reliance could be placed on technical articles emanating from this country, instead of publishing translations and reprinting American articles. There appeared in the issue a number of articles by such well-known authors as Mr. J. R. Moorhouse, Mr. F. Johnson, Mr. A. R. Bartlett (surely a pioneer in accident prevention), Mr. M. G. Gallon and Mr. E. L. R. Lead—names which are still revered.

Presentation to Mr. P. L. Gould O.B.E.

Mr. P. Leonard Gould, who recently retired from active participation in the affairs of the Joint Iron Council and the Council of Ironfoundry Associations, was presented in the course of a meeting of the Council on January 19 with a silver rose-bowl, to mark his colleagues' appreciation of many years of service to the ironfounding industry. The presentation was made by the president of the Joint Iron Council and chairman of the Council of Ironfoundry Associations, Mr. N. P. Newman, who paid tribute to Mr. Gould's work. Mr. S. H. Russell, also, spoke in terms of praise of Mr. Gould's wisdom in council and the deep knowledge that inspired it.

At the time of his retirement, Mr. Gould was one of the three vice-chairmen of the Council of Ironfoundry Associations, and in that capacity represented engineering ironfounders. He was also a member of the executive committee of the Council and of the Joint Iron Council executive. Included in Mr. Gould's long career of honorary work on behalf of his fellow ironfounders was his membership of the executive board of the National Ironfounding Employers' Federation, upon which he was prominent from 1937 onwards. He was a vice-president of the N.I.E.F. for 23 years.

In addition, he has represented the ironfounding industry as a member of the board of management of the Engineering and Allied Employers' National Federation (EEF). As a member of that board, he sat also on the Joint Advisory Committee on Conditions in Ironfoundries—the well known "Garrett Committee," and later on the Joint Standing Committee which was evolved from it.

Mr. Gould is one of the original band of ironfounders who came together in 1940 and 1941 to study the needs of the industry during the war, and from whose meetings there developed in the latter year the present-day Council of Ironfoundry Associations. Prominent in furthering the prosperity of industry and the development of employment in Wales—his works, Gould's Foundries, Limited, is at Cardiff—he received the OBE in recognition of his public services in this connection in the New Year Honours of 1955.

George Kent's Apprentice Training

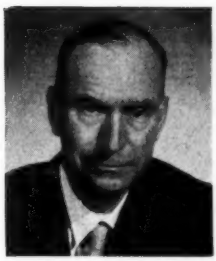
Commander P. W. Kent, R.N., chairman and managing director, presided at the annual apprentice prize-giving of George Kent, Limited, at Luton on January 16. The guest speaker was Mr. A. J. Young, president of the Society of Instrument Technology, who reminded his large audience of the country's need for greater numbers of engineers, scientists and technicians. Speaking from personal knowledge of the instrument industry, Mr. Young advised apprentices to follow the guidance of their leaders in the firm which was a company second to none in products, research, educational work and, lastly, in integrity.

Kent's had 140 apprentices under training during 1955 and the major prizes presented were: "Commander Kent Challenge Cup to Mr. H. R. Ledger; Sir Walter Kent prize to Mr. J. C. Keeling; R. W. Bedford Challenge Cup to Mr. E. L. Amiss; and the Grout Prize to Mr. W. Carrington." An exhibition held in conjunction with the prizegiving included a wide range of models and pictures illustrating the training and work of the apprentices.

Progress with the CO_2 Process in British Foundries*

By A. Tipper, M.Sc., F.I.M.

The Author reviews recommended procedures in core and mould making by the Process and discusses its advantages for various types of work. A description is given of the methods of operating the Process in four different types of foundries. Present applications and future trends; the use of various bonding agents; additions for achieving good surface-finish and easy knock-out, in addition to economics, are among other aspects discussed. In dealing with the nature of the sand bond, a number of hints are given on optimum mixing procedure and methods to secure adequate green-bond and collapsibility before and after casting, respectively. Next, gassing procedure and equipment, costs, surface treatment and possibilities of sand reclamation are outlined. A number of practical examples is given of castings currently being produced using CO_2-Process sand for moulds and/or cores. Included amongst these are grey-iron air-cooled cylinders and large cylinder-blocks, die-cast rear-axle housings in aluminium alloy, and copper-base-alloy gate-valves. [At the London meeting, a film was shown to illustrate applications of the Process.]



MR. TIPPER is general manager of the foundry supplies division of Harborough Construction Company, Limited. He studied science and metallurgy at the Central Technical College, Birmingham, gaining an external degree of London University in metallurgy. Successively, he was with Fordath Engineering Company, Limited; Wilmot Breeden, Limited; Langley Alloys, Limited, and Birmingham Aluminium Casting Company Limited, before he joined his present company. A member of the Institute of British Foundrymen since 1932, Mr. Tipper was president of the Birmingham branch in 1939.

Historical

About 18 months ago an extract appeared in the FOUNDRY TRADE JOURNAL, of a German paper written by Dr. Schumacher: "Making Cores and Moulds by CO_2 Hardening." The same issue of the JOURNAL carried an Editorial on the subject which makes interesting reading to-day, as already in this comparatively short space of time most of the predictions made then have come true. Up to that time, very little real interest had been shown by British foundries in the possibilities of this process (although it had already been demonstrated to a fair number of them as far back as 1952), with just one or two notable exceptions, such as the work carried out at the Glanmor Steel Foundry by Mr. Ivor Rees early in 1954. Immediately the details of the practical use of the process were given publicity, a number of British foundrymen saw in it the answer to certain problems of production and really "tried it out." One of these was Mr. A. Talbot, to whom founders are indebted for his forthright paper† describing his experiences and experiments.

The Author's first introduction to the CO_2 Process came from Mr. Alfred Augstein, who, with his brother, worked on the process in Czechoslovakia in 1947 and returned to this country in 1948, when the laboratory development work commenced. At that time and for several years subsequently it was believed that the Author and his colleagues were working alone on this entirely novel principle applied to coremaking. They had to establish all the conditions for the successful production of castings—such as the type and quantity of silicate and other additions to produce a satisfactory break-down, etc., work which eventually led up to the application for a Patent in 1951.

Present Status

Turning now to the present conception: whilst not as revolutionary as the shell-moulding process, which is also still undergoing development and extending in use, the CO_2 Process of hardening foundry cores and moulds *in situ* without any heating, simply by passing through the rammed mass of sand a stream of carbon-dioxide gas, has in the past 12 months achieved wide interest and is being adopted to varying degrees by most branches of the British foundry industry. The request for demonstrations has in fact been so heavy as to cause our demonstrators some embarrassment.

Its main attraction lies first of all in the elimination of all baking or drying. A second most valuable feature is dimensional accuracy, which is maintained by the sand mass after removal from the corebox or pattern. In this respect, there is a definite improvement over organic bonds or oil sands, even those using a high proportion of starch or dextrine, which in spite of being air-hardening, are seldom sufficiently rigid to prevent slight sagging or distortion occurring after stripping from the corebox or during baking. In this respect the CO_2 Process has similar advantages to the shell

* Paper presented to the London branch of the Institute of British Foundrymen, Mr. V. C. Faulkner presiding.
† Printed in the JOURNAL May 26, 1955.

mould or core, which is hardened whilst in contact with the pattern. There is no evidence of any measurable expansion of the sand mass when it is CO_2 hardened, although there is a small evolution of heat.

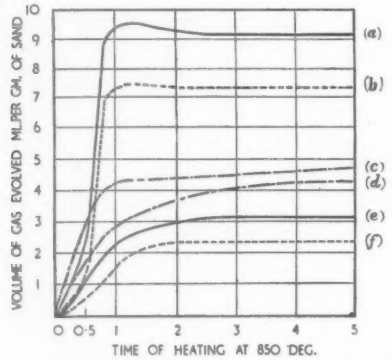


FIG. 1.—*Comparison of gas evolution (rate and quantity) from CO_2-Process sand mixtures compared with that from typical oil/cereal cores (baked).*

Key: (*a*) 3.5 per cent. and (*b*) 2.0 per cent. oil/cereal mixtures; (*c*) and (*d*) 4 per cent. gas-binder grade-10 mixtures with 1.0 and 0.5 per cent. pitch, respectively; (*e*) and (*f*) 4 and 3 per cent. of gas-binder grade-10 alone.

The Binder

The silicate-base binders employed in the CO_2 Process to date are mainly proprietary compounds in the form of liquid emulsions, developed in this country by two supply firms. The hardening or "set" obtained in sand bonded with these materials is explained by the chemical reaction between carbon-dioxide and the Na_2O molecule, which is converted to sodium carbonate (Na_2CO_3), and by so doing reduces the ratio $Na_2O:SiO_2$ below the limiting value to maintain silica in solution, which is therefore precipitated. The lower this alkali ratio in the sodium-silicate solution, therefore, the easier is precipitation brought about.

The more concentrated the silicate (*e.g.* higher solids content) the more viscous the solution, but the better the adhesive properties. The viscosity of silicate solutions increases rapidly with a lowering in temperature, hence it is always advisable in cold weather to keep the CO_2 bonding material stored in a warm place a few days prior to use, or to warm small containers filled prior to use; warming silicate is slow work.

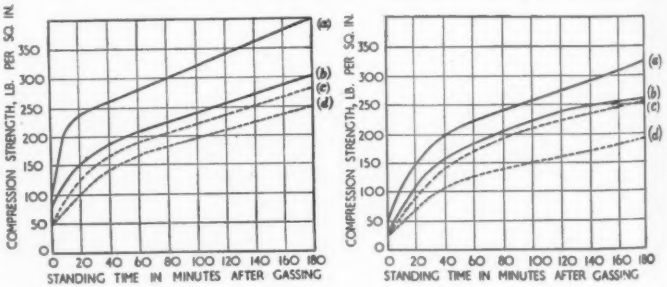
One of the main reasons for the immediate success of the CO_2 Process is that it can be introduced without any real change in normal foundry procedure apart from the actual "gassing" of the core or mould, using the existing equipment for sand preparation and core- or mould-making. Initial trials can be carried out with the simplest of tackle or special equipment, and at very low cost (*vide* Fig. 5, which shows moulds for air-cooled-cylinder castings in grey iron, produced with a facing of CO_2-Process sand and hardened after removal of the split pattern by gassing down the runner), so that there is every inducement even to the smallest foundry to "have a go." A number of jobbing foundries in this country have made a successful start with the production of sizeable engineering castings within a month of their initial introduction to the Process, and within six months they have changed over the whole of their production, without interruption of work or any special training of operators.

Practical Details

Considering briefly the practical details of operating the CO_2 Process in any foundry, it should be borne in mind that the same general principles apply, whether in a jobbing or a mass-production foundry, a light-alloy die-casting foundry or a heavy iron foundry. The first requisite is a supply of clean, dry silica sand as used for oil-sand core-making; secondly, an efficient core-sand mixer. Types of British sands which have been used successfully include most of the well-known foundry silica sands such as Erith, Leighton Buzzard, Redhill, Congleton, Chelford, Southport and similar sea-beach or dune sands. Fine-grained sands such as Redhill H, Ryarsh and Chelford Fine Washed can be recommended for special work requiring a particularly good surface finish or reproduction of fine detail, as in the case of cast die-plates and glass moulds. The sand should be cold as well as dry when mixing, in order to avoid drying out the small amount of moisture present in the bond.

Mixing

Sand preparation requires no special procedure, except to avoid (*a*) mixing oil- or resin-bonded sand



FIGS. 2 *and* 3.—*Strength of sand mixtures after CO_2 hardening* —FIG. 2 (*left*) *Congleton silica and* FIG. 3 *Southport sea sand —with varying percentages of gas-binder additions.*

Key: (*a*) and (*b*) respectively 4 and 3 per cent. of gas-binder grade 10; (*c*) and (*d*) 4 and 3 per cent. of gas-binder grade 9.

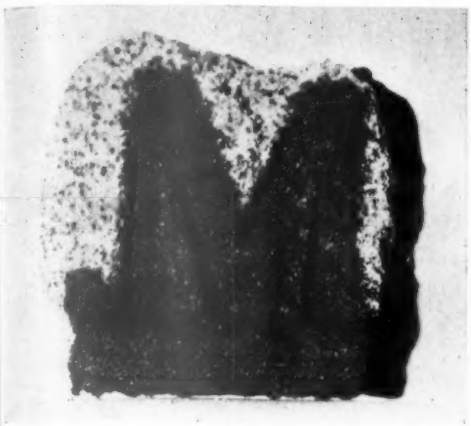


FIG. 4.—*Portion of a CO_2-Process mould stripped from the face of a steel casting; no mould dressing was used.*

with CO_2 Process sand, and (*b*) prolonged milling or "heating up." Any dry additions should be made first to ensure good distribution, together with any clay-bonded sand, which should be in a ready-milled condition when added. Sufficient milling is essential for good results; bad milling can be responsible for weak, friable cores after gassing. The sand should be of a uniform colour, smooth and free from lumps and with a slightly damp feel.

Additions

When dealing with metals cast at high temperatures, as, for example, iron castings, there are two factors to bear in mind. One is the influence of heat on the mineral bond, as this has a practical bearing on the knocking-out of cores. Whilst with oil sand the overheated and burned bond is at its weakest when still hot, the reverse is the case with the CO_2-Process bond, which is plastic at red heat, and removal of sand is far easier when the casting has cooled down to "black" heat. In order to achieve a reasonably easy breakdown of the core or mould surface which has been subjected to high temperature, a small proportion of fine material, usually of a carbonaceous nature, such as pitch, coal-dust, plumbago, or wood-flour, is added to the sand. This decomposes at or near the sand/metal interface, and the gas produced no doubt assists in preventing any penetration or wetting of the sand surface by liquid metal much in the same way as coal dust in normal moulding-sand mixtures for iron castings. Seldom are any such additions required for aluminium castings, except as inhibitors of metal/mould reaction or to improve casting finish.

The second factor is the relatively low gas content of the CO_2-Process sand. Even with an addition of 1 per cent. of pitch, the gas content is still low by comparison with the average oil-sand-bonded core (see Fig. 1), and without such an addition there is almost certain to be metal penetration of the core with certain alloys, increasing in seriousness as the metal section and pressure of metal increases. A secondary effect of additions of carbonaceous material is to prevent the fritting and fusing of the bond and sand grains into a brick-like mass, partly due to mechanically weakening of the sand mass and partly by deposition of a

FIG. 5.—*Mould and cores for an air-cooled grey-iron cylinder casting; also showing casting after shot blasting and the equipment used for CO_2 hardening.*

FIG. 6 (*a*).—*Part of the coreshop at Perry Barr Metal Company Limited, showing blowing and gas-hardening of CO_2-Process cores.*

FIG. 6 (*b*).—*CO_2-Process core ready to go into the die and a casting coming out of the die at Perry Barr Metal Company Limited.*

carbon film on the sand grains. For light iron castings an addition of 0.5 per cent. of pitch, plumbago or coal-dust is usually adequate; for heavy castings, the addition is increased to 1 or even 1½ per cent.

Other addition agents are being developed which combine the effect of a carbonaceous material with varying degrees of green-strength (more about the development of green bond is included later in the Paper). A number of substances are being tested in an attempt to confer green-bond strength and to assist breakdown of the bond after casting. These include sulphite lye, core-gum, bentonite, alginates and mixtures with clay. Typical sand mixtures are shown in Table I.

TABLE I.—*Typical Examples of CO_2-Process Sand Mixtures.*

Purpose.	Sand mixture.	Parts by wt.
(1) Facing sand for moulds for iron castings up to 5 cwt. (green-strength about 3.0 lb. per sq.in.)	Congleton Silica Sand, dry	90
	Milled Red Sand, moist ..	5
	Gas-binder, grade 9 ..	4
	Green Bond Agent ..	1
(2) Core-sand mixture for light malleable-iron castings (green-strength, about 1.5 lb. per sq. in.)	Congleton Silica Sand, dry	95
	Milled Red Sand, moist ..	5
	Gas-binder, grade 10 ..	2.5
	Pelleted Pitch	1.0
(3) Moulding sand for large grey-iron castings up to 30 tons (green-strength 3.5 to 4.0 lb. per sq. in.)	Southport Sea Sand ..	100
	Floor or Backing Sand ..	2.5
	Strong Yorks. Sand (17 per cent. clay)	1.25
	Green Bond Agent ..	0.5
	Gas-binder, grade 10 ..	4.0
	Pelleted Pitch	0.75
(4) Core-sand mixture for blown cores for aluminium die-castings (green-strength about 0.75 lb. per sq. in.) (see Fig. 6)	Congleton Silica Sand, dry	100
	Gas-binder, grade 9 ..	3
	Plumbago	0.5 to 1.0

Green Bond

Particularly for moulds, the main considerations to bear in mind when developing adequate green bond are:—

(1) Additions should be as low as possible.

(2) The inclusion of clay-bonded sand must be limited to, say, 5 per cent. for iron castings.

(3) Returned sand or floor sand containing coal-dust or pitch—maximum 10 per cent.

(4) Special addition agents—1 to 1½ per cent. (exceptions, for very high green strength, are the inclusion of sulphite-lye powder, core-gum, bentonite, or alginates).

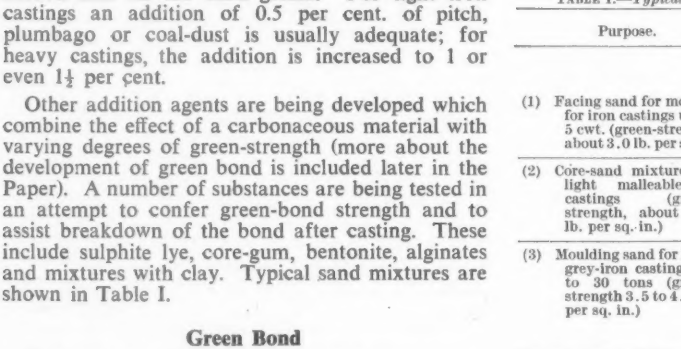


FIG. 6 (*c*).—*Ease of knockout of a core from the casting shown in* FIG. 6 (*d*).

Storage of Mixed Sand: In a foundry where no provision is made for storage hoppers or for enclosing core sand, wastage is liable to occur, due to (*a*) drying out of moisture, (*b*) reaction between the bonded sand and CO_2 from the air. With proper storage in closed bins, mixed sand can be kept in good condition for a long time.

Core and Mould Production

CO_2-Process sand is more flowable than clay-bonded moulding sand and can readily

be used on impeller rammers, plain jolt and jolt/squeeze moulding machines, on coreblowers and core-"shooters"; in fact, normal foundry methods can be utilized; CO_2-Process sand can also be strickled; sleeking and patching is a simple technique. To assist stripping from wooden patterns and boxes, the use of parting powder is advocated and hard, alkali-resistant cellulose varnish should be used for patterns. For jointing cores an air-hardening adhesive is most effective. Rapping before gassing is a most important rule. Shell cores are ideal for assuring good collapsibility and knock-out properties. Moulds made with a facing of CO_2-Process sand need backing up with an open-texture moulding sand. Coreboxes should be designed preferably to pull away from the core; frame boxes are good. Bulky cores should be hollowed out, but there is no need to fill them with ashes when there is no risk of metal running in.

Gassing Procedure and Equipment

CO_2 Consumption: For economy reasons, it is preferable to undergas and let the atmospheric CO_2 complete the hardening process—under these conditions the CO_2 consumption is below 1 per cent. of the weight of sand used. For cores which have to be handled immediately, full hardening is most desirable and CO_2 consumption may be as much as 2 to 3 per cent. by weight. The aim should always be to harden the face against which metal will run.

Gas Pressure: The tendency is to advocate higher gas pressures, *e.g.* 20 to 50 lb. per sq. in., to secure increased speed of production. This is permissible for suitable jobs, such as large moulds and cores, but unless an efficient clamping attachment is in use much pressure is lost and also a lot of gas. There will soon be equipment on the market to work in conjunction with coreblowers and "shooters" for the mass production of CO_2 Process cores. An indication of overgassing is a white appearance of the surface, leading to friability on standing.

Gassing Time: As a guide, a minimum time of about 5 sec. increasing, say, by 1 sec. per lb. at 20 lb. per sq. in. pressure, is a suitable period. For example:

	Sec.
A core weighing 25 lb. will require gassing time	20
A core weighing 50 lb. will require gassing time	40
A core weighing 100 lb. will require gassing time	60

For large cores and moulds, say, one min. per cwt. of sand at 20 lb. per sq. in. pressure is adequate.

Properties of CO_2-Process Moulds or Cores

(*a*) *Strength of Gassed Sand:* Figs. 2 and 3 show the compression strength of mixtures based on (*a*) Congleton and (*b*) Southport sea sand immediately after gassing and after standing for various times. The effect of clay-bonded-sand additions is to reduce the strength of the gassed core or mould. A

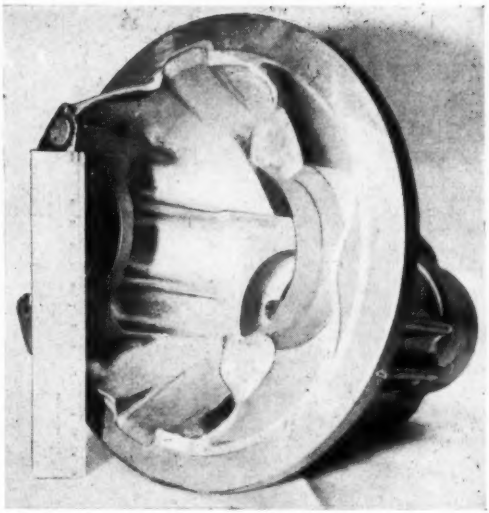


FIG. 6 (*d*).—*Typical rear-axle housing die-casting, showing the finish obtained with the CO_2-Process core (a 6-in. rule is shown alongside to give an appreciation of size).*

CO_2-Process mould shows improved chilling and densening effects. The faster rate of heat abstraction from the casting, coupled with the good strength of the bonded sand shows marked advantages for CO_2-Process moulds—resulting in sound accurate castings (see Figs. 4 to 8). The enhanced rate of heat extraction has proved also of advantage in reducing the need for metal chills in cores and moulds for light-alloy castings.

(*b*) *Moisture Resistance* of CO_2-Process bonded sand is *not* good, and cores for green-sand moulds should therefore be cored up as late as possible before closing. When using a CO_2 sand facing with a green-sand backing, the facing should be a minimum thickness of 2 in. for safety—moulds can be made one day and cast the next if necessary; (see Fig. 9 showing moulds for 5-cwt. cylinder-block castings using CO_2-sand facing).

(*c*) *Patching* of moulds should be effected by cutting-out to form a "key" for the new sand (using air-drying adhesive or core-gum, or diluted gas-binder to moisten the surface), then sand should be rammed in and hardened off with gas.

Costs and Economics

Direct costs when using the CO_2 Process show a slight saving on core-making materials as compared with normal bonds, but economies are considerable in fuel cost; (cost of binder plus gas is roughly the same cost of oil sand).

Example:—

With gas-binder at about 4½d. per lb. and an average mix of 4 lb. per 1 cwt., cost = ... **1s. 5d.**

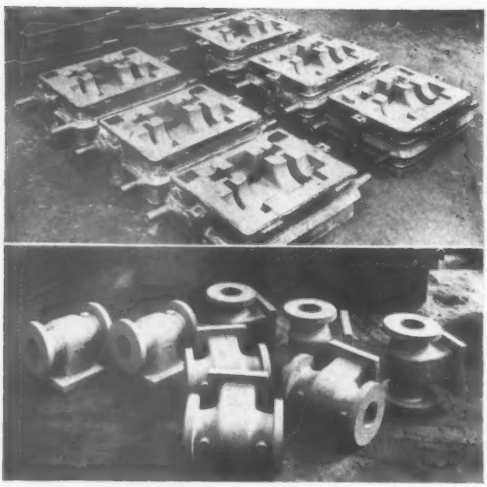


FIG. 7 (*above*).—*Half-moulds for a gate-valve casting; and* FIG. 8—*a group of finished castings after dressing.*

(Carried forward	1s. 5d.)
With CO_2 at about 4¼d. per lb. and an average mix of 1 lb. per 1 cwt., cost = ...	4d.
	1s. 9d.
For oil binder or compound at 7d. per lb. at 3 lb. per cwt., cost =	1s. 9d.

The cost of the CO_2 gas is usually between 3d. and 6d. per cwt. of sand treated.

Comparing Indirect Costs: Fettling costs would be equal; handling costs for CO_2 Process reduced appreciably; there is a faster turn round of equipment; increased production for the same floor space (limited only by mixing capacity and melting plant), and possibly reduced fettling when the new process is used.

Further Treatment of Cores and Moulds

Where it is standard procedure to spray or paint cores and moulds with blacking, plumbago wash or proprietary core coatings, the same dressing may be applied to the CO_2-hardened cores. Self-drying volatile dressings which can be ignited and will burn off quickly and completely are recommended. If a water-base blacking is used, cores and moulds must be dried well before use.

Drying or baking the core for a relatively short time, say 10 to 20 min. in any type of core or mould stove, gives a very marked increase in strength (equal to that of oil-sand), and is particularly recommended to overcome the risk of cracks or breakages with cores of weak section. The temperature of drying is not critical, say between 350 and 500 deg. F. (170 to 250 deg. C.). A longer time in the stove, up to 2 or 3 hours, will not spoil the cores. Such baking, however, is unnecessary in most applications.

Recent Trends

Recent trends in the development of the Process include:

(1) An increased use of multiple CO_2-cylinder installations; liquifiers for solid CO_2 and one or two installations of bulk-storage tanks for liquid CO_2; (two such plants have already been installed in Midland foundries—one ton per week of CO_2 is being used in one such foundry).

(2) The possibility of making shell cores by the CO_2 Process for thin-walled castings and castings sensitive to hot-cracking; also for stack moulding from multiple-impression patternplates.

(3) Increased use of the CO_2 sand as a facing to replace dry-sand moulds, for medium and large iron castings.

FIG. 9.—*Mould for a 500-lb. grey-iron cylinder-block casting using CO_2-Process sand and a casting produced from such a mould.*

(4) Use of alternatives to pitch as "breakdown" additions.

Some problems remain in applying the Process in some steel foundries, due to fritting and partial fusion of sand against the face of a casting, but provided a 100 per cent. new-sand facing is applied the surface obtained is comparable with that of green sand castings, generally; (see Fig. 4—a small portion of a CO_2 mould face stripped from a steel casting.

Mould dressings may be applied when necessary; those recommended are as follow:—

For aluminium—Talc or plumbago plus french chalk; for brass, bronze, gun-metal—basically plumbago; for cast iron—Carbon blacking or plumbago; for steel—Silica-flour, zirconia, alumina, etc. (by no means always necessary).

Such dressings, prepared with a spirit base instead of water, are available, which are self-firing and require no heat for drying off before casting.

Re-use of Sand

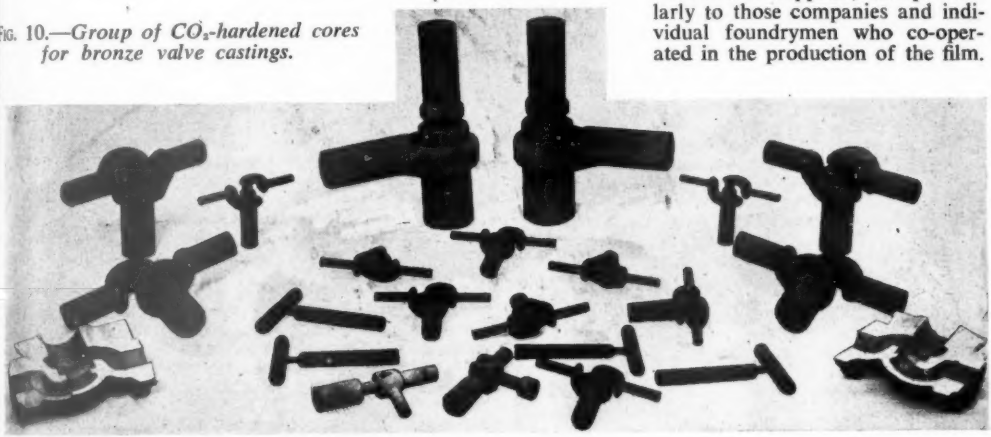
At present repeated use of sand is not to be recommended except as a small addition to the mix (say up to 10 per cent. for facing sand). However, re-use of this material in backing sand presents no problems.

Application of a Hydroblast plant or a water scrubber offers the real answer to CO_2 sand reclamation—leaching by exposure to weather is a slow (but cheap) process.

Looking ahead, it seems probable that chemically-hardened bonds for sand will in time replace almost entirely those based on the oxidation of drying oils and baking of starches and other organic bonding materials. However, a word of warning should be interposed, for it is felt that at present the application of the CO_2 Process has to some extent outstripped development and research, and there may therefore be certain cases of disappointment, and, even (as has been witnessed on occasion with shell moulding) a swing-back to the old-established methods. All rapidly-growing things suffer from "growing pains," and the CO_2 method is no exception, but this will not prevent the steadily expanding use of this unique process.

In conclusion, the Author expresses his thanks to the management and directors of the various companies who have permitted him to make use of information supplied, and particularly to those companies and individual foundrymen who co-operated in the production of the film.

FIG. 10.—*Group of CO_2-hardened cores for bronze valve castings.*



Publications Received

Safety in the Ironfoundry, by Colin Gresty; published by the Council of Ironfoundry Associations, 14, Pall Mall, London, S.W.1.

This pamphlet is a reprint of a paper which the author read before a meeting of the Royal Society for the Prevention of Accidents. It deals with this subject under the main headings of: Dust Control; Knocking Out; Eye Protection; Respirators, Foot Protection; and Guards on Foundry Plant and Machinery. Some excellent means of preventing accidents are described and illustrated. Yet the reviewer would have liked the author to have called attention to careless stacking of pig-iron and moulding boxes, and the need for properly dried ladles, for these are still causing grave accidents. However, Mr. Gresty has well covered the more modern aspects of accident prevention, but elementary precaution are still important.

The African Mineworker in the Copperbelt of Northern Rhodesia; published by the Rhodesian Selection Trust Group of Companies, Hardwicke House, Jameson Avenue, Salisbury, Rhodesia.

This well-illustrated 50-page brochure describes the working and living conditions of the Africans employed in the copper mines of the publishers. There is a much wider field involved than is disclosed by this statement, for it is abundantly clear that in the copperbelt there is a market of ever-increasing importance to British industry. The mineworker is about four times better off financially than he was ten years ago, whilst the population of the townships of the two bigger mines—Mulfulira and Roan Antelope—have grown from 27,000 to 58,500. The brochure is full of interest dealing as it does with the background of the African, wages, housing, social work and athletics. It is available to readers on writing to the Public Relations Officer at the address given above.

Notes from the Branches

Tees-side

To a Tees-side branch meeting of the Institute of British Foundrymen, Mr. Laurence Brown gave an interesting lecture on "Pattern Equipment—Present-day Trends and the Future of Patternmaking Craftsmen." It was very well attended, members having been notified beforehand that the subject matter was likely to prove very controversial. The president, MR. FRANK SHEPHERD, in opening the meeting, said he was aware of Mr. Brown's revolutionary ideas with regard to patternmaking, though he did not necessarily agree with all of them, and probably members, too, would find grounds for argument.

MR. BROWN began by pointing out that patternmaking was one of the oldest of all crafts and had been in use since man first poured molten metal into moulds for the production of utilitarian and decorative castings. In former days a patternmaker was required to be a superman; to-day, he contended, this was not necessary. Specialization was now an accepted fact and patternmaking must follow the modern trend. A pattern should not, in his view, be made purely to the patternmaker's idea.

Particular Trends

Mr. Brown mentioned that general-engineering patterns of the "one off type" continued to be made in soft woods though demand had been reduced by the increasing use of welded structures. Large pattern equipment was still required for steel foundries and mahogany patterns were still much in demand in the aircraft and automobile industries. The present-day size of the automobile industry called for small castings of first-class metal construction and of a standard and finish once only obtainable in a tool-room. Such castings could be obtained by the use of pressure-cast plates in aluminium which were particularly suited to the needs of mechanized or semi-mechanized foundries.

The speaker then outlined the organization required to produce pressure-cast pattern equipment in aluminium, and emphasized the importance of a pattern-shop drawing office which could act in a liaison capacity between purchaser and patternmaker. He advocated further training in foundry practice, etc., for patternmakers so that they were fully cognisant of modern foundry trends, and urged that the fullest use be made of the National Foundry College, where the curriculum was so well suited to such types of craftsmen.

Stressed, also, was the value to industry of university graduates. These people were trained to think clearly and to learn quickly; they were not hidebound by tradition and even graduates who had specialized on the arts side were found to be quick to assimilate knowledge of techniques and to become valuable to industry.

Resistance-wire Drying

During the lecture, two films were shown, the first by courtesy of the Mond Nickel Company, Limited, on "Aluminium Pressure Plates" and the second by the Midland Electricity Board. The latter showed experiments which were being carried out to dry plaster moulds by the incorporation of a suitable, wire heating-element, the intention being to find a quicker and more economical method than the elaborate and expensive ovens at present being used for this purpose. The arrangement seemed to be working quite satisfactorily but Mr. Brown stressed the fact that the whole of the work was in the experimental stage.

From the discussion which ensued, it was obvious that there were many present who did not agree with Mr. Brown—particularly those who had started life as patternmakers. Several speakers, too, doubted the wisdom of appointing to managerial positions, graduates who had no industrial experience whatsoever. One or two members only asked questions relating to the technical side of the Paper. The vote of thanks was proposed by MR. H. POTTS who said that he would like to be different and agree with the speaker on several points. He thanked Mr. Brown and Mr. R. Cherry, who had assisted the lecturer in the preparation of the film, etc., for an extremely well-informed and interesting lecture.

Bristol and West of England

"Cupola Practice" was the subject of a Paper given to the Bristol branch at the Grand Hotel, Bristol, on January 14. In presenting the Paper, Mr. W. H. Bamford stressed the efficiency of the cupola as a melting unit but emphasized that certain obvious precautions must be taken in operating this furnace if maximum benefits were to be obtained. Amongst such attention to detail was the necessity for weighing all the component parts of a charge, including coke and limestone—it was useless if after weighing of the metal portions of a charge the coke and limestone were added by guesswork. Furthermore, the individual items comprising the metal charge, *i.e.*, pig-iron, steel scrap, and foundry "returns" should be weighed. In advocating the shotblasting of all steel scrap intended for use in the cupola, Mr. Bamford said that he considered this necessary in view of the large quantities of rust often found adhering to such scrap and which, tending to produce an oxidizing slag, could lower the fluidity of the molten metal.

Economic use of works arisings of scrap was always possible when such returns were continuously available in reasonable quantities from the service departments belonging to a given works. It was found that the quality of cast iron was always better when the ratio of pig-iron to steel scrap showed a preponderance of pig-iron, as charges too high in steel scrap often resulted in metal having blowholes. Water cooling of cupolas could normally be safely practised and little fear of furring could be expected in some areas, though this was entirely dependant on the characteristics of local water supplies. Carburization of steel scrap usually was considered to take place in a region about 18-in. above tuyere level, above this zone it was very doubtful if appreciable carburization took place.

A vote of thanks to the Author was proposed by Mr. G. Thonger, and seconded by Mr. F. Vickery, both of whom expressed appreciation for a very interesting and instructive Paper, supported by many years' experience in the particular field of cupola operation.

A CONFERENCE on "Functions and Education of Welding Engineers" organized by the Institute of Welding will be held at Ashorne Hill, near Leamington Spa, from September 16 to 18. Some 22 papers have been promised and will be discussed in four sessions. It is expected that the conference will attract, beside welding engineers, others concerned with technical management in the engineering industry, and teachers of engineering subjects from the universities and technical colleges.

Taylors Foundry—Organization of a Small Non-ferrous Shop

A visit to Taylors Foundry, Limited, Wharf Estate, Ealing Road, Alperton, Middlesex, was of real interest to the writer, who had just been reading a report on five small American grey-iron foundries*, because here was a background suitable for comparison. Briefly, the history of Taylors Foundry is that Mr. H. Taylor—a highly-skilled foundryman—started business in 1946 in two workmen's cottages. He and his first employee, now his foreman, built themselves a pit furnace and made castings for the local works. Business expanded and a small shop was acquired. This has recently been more than doubled in size and now measures 170 by 27 ft. (Fig. 1). The total staff now numbers 16, including Mr. Taylor and his son, who is an accountant. As Mr. Taylor still, when required, does some moulding himself, it means that—like the American foundries described in the report—no "passengers" are carried and everybody is on production. Whilst the American foundries carry a night-shift, the system at Alperton is for the men to clean up the shop before leaving and have everything ready for starting next morning.

Wisely, compositional control for both the light alloys and copper-base castings is founded on the purchase of ingots of guaranteed analysis, coupled with meticulous care in seeing that all runners and risers are stored according to their composition.

Plant

For melting, the following coke-fired furnaces have been installed:—A Morgan 400-lb. tilter, a 100-lb. furnace of the same make and two Midland monolithic of 150- and 100-lb. capacity. In construction are two additional pit-fired furnaces to take crucibles of 200-lb. brass capacity. There is installed a turnover machine by British Moulding Machine Company, Limited, for use when suitable repetition orders are received. For handling, there is a monorail carrying a 30-cwt. pulley block. To aid fettling, there is a Coleman-Wallwork abrasive cut-off machine, a Sagar band-saw, and a Qualters double-ended grinder. There is also a Fordath mixer for the preparation of core sand. Adjustable steel shelving is used for the storage of patterns. In general, the equipment is quite adequate for a small non-ferrous foundry.

The output, which obviously varies from week to week, is of the order of one ton of aluminium and 50 cwt. of copper-base castings, figures which should materially increase now that the new extensions are complete. The employees much appreciate the provision which has been made for washing, and six hand-basins have been installed.

It has been the practice of Mr. Taylor to send his foreman to the training courses organized by the Institute of British Foundrymen, moreover he himself is assiduous in his attendance at the Institute's technical meetings and those of the Association of Bronze and Brass Founders. He is experimenting with the CO_2 Process and has suggested some novel applications for it. Taylors Foundry has made commendable progress since its inception nine years ago and the writer has confidence in stating that it will continue to make headway.

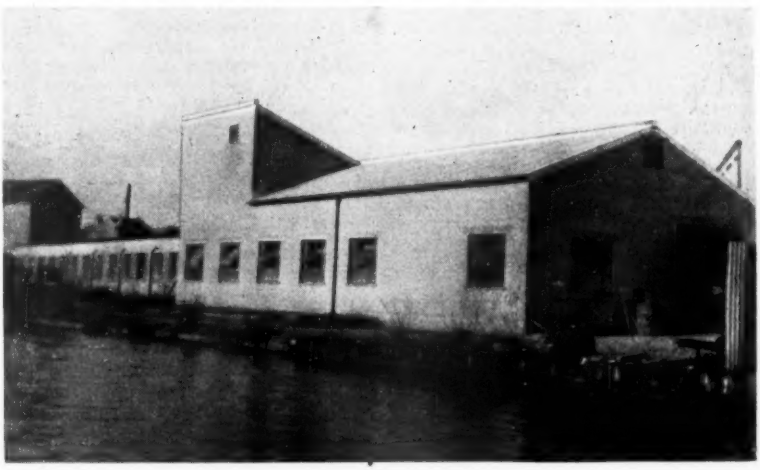


FIG. 1.—*Exterior view of Taylors Foundry, Alperton, Middlesex, showing the new extensions.*

* Five Small Gray Iron Foundries: An (American) Foreign Operations Administration Report, distributed in Great Britain by the British Institute of Management, 8 Hill Street, London, W.1, price 10s.

A SPECIALIST DIVISION has been set up by the Institution of Works Managers to co-ordinate the activities of British industrial engineers, covering such subjects as plant layouts, mechanical handling, material usage, time and motion study, production, planning, and costing.

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

742,514. Société Civile d'Etudes pour Materiel de Fonderie, 150 Rue des Bains, Bagneux (Seine), France.

A pneumatic or hydraulic control-device adapted for stripping foundry cores. It consists of three or more elements which comprise (a) a first piston movable in a cylinder and intended to be connected to one element to be controlled; (b) a second piston movable with respect to the cylinder, the active surface of which is less than the surface of the first piston which is active during core withdrawal and intended to be connected to a second element to be controlled; (c) a fluid inlet passage communicating with the cylinder between the two pistons; (d) a stop solid with the first piston, and (e) a stop solid with the second piston. These stops are so placed that the first one meets the second and carries it along after displacement of the first piston. With one cylinder and in a single operation, one element of the mould core is displaced in one direction while exerting on the other element of the mould core a force in an opposite direction. This other element is thus subsequently displaced in the same direction as the other element.

742,575. Crofts (Engineers), Limited, Thornbury, Bradford, Yorks.

An improved method, and means for the melting of metal swarf which utilizes the heat generated in a forced-draught furnace, such as a cupola or blast-furnace, for the melting of swarf as well as for the smelting or melting of the normal furnace charge.

742,641. Siegried Junghams, Schorndorf/Wurttemberg, Grabenstrasse, Germany.

A process for the artificial age-hardening of aluminium alloys. The alloys are brought in such manner from the solution-annealing temperature to the temperature of warm age-hardening, and are maintained at this temperature for such a period that cold age-hardening, precipitation or other modification of the supercooled solid-solution does not take place at any higher or lower temperature than the temperature of the warm age-hardening.

Railway Commercial Practice

A supplement to Vols. I and II of "Railway Commercial Practice," by H. F. Sanderson, has been published by Chapman & Hall, Limited, 37, Essex Street, London, W.C.2. It includes the main features of the Transport Act, 1953, the new organization of the British Transport Commission and British Railways introduced largely as the result of the Act, various passenger charges schemes, the maximum charges scheme for merchandise submitted to the Transport Tribunal in March, 1955, and an outline of the plan for the modernization of British Railways. The opportunity has also been taken of giving information about other recent developments on the railways.

UNDER the auspices of the Metallurgical Engineering Committee of the Institute of Metals, an all-day informal discussion on "Furnace Refractories for the Use of the Non-Ferrous Metal Industries" will be held at the University, Edgbaston, Birmingham, on February 24.

Stourport Foundry to Close

One of the oldest and once the largest firm in the county of Worcestershire to manufacture cast-iron hinges—Baldwin, Son & Company, Limited, Stourport ironfounders, which was for many generations in the Baldwin family—is to close down shortly. The reason given by the directors is that they wish to improve efficiency and cut down production costs. Until the outbreak of the war, the company used to manufacture, as well as butt hinges, a considerable amount of cast-iron hollow-ware, and during the war was engaged in the production of hand-grenade casings.

The foundry, in the street which bears that name, was established about 1791, and now employs about 60 workers, most of whom, it is hoped, will be absorbed by either of the associated companies—the Anglo-Enamelware Company, Limited, Stourport, and Archibald Kenrick & Sons, Limited, West Bromwich, where the business will be transferred. The works at West Bromwich offer greater scope in providing modern plant suitable for the production of hinges. About a quarter of the foundry's employees are women and, though some will be found work at the Anglo-Enamelware Company, several will be found other employment.

Mr. C. J. Kenrick, the managing director, explained that with cast-iron hinges one had to compete with steel to a large extent, and beyond a certain price people would not buy them. The trade, though small, was highly competitive. The company have a full order-book and was very busy, but at Stourport it was not possible to expand economically and sufficiently to reduce prices, which was the main aim these days. The nature of the Stourport works did not give scope for modern methods.

Steelworker's Appeal Award

An award of damages to an Edinburgh steel dresser who contracted pneumoconiosis as a result of inhaling silica dust at his work, was the subject of an appeal before the House of Lords on January 19. Judgment was reserved. Bonnington Castings, Limited, steel founders, Leith, appealed against the award of damages of £2,000 to J. H. Wardlaw (41), of Edinburgh, by the Court of Session. The appeal was heard by Viscount Simonds, Lord Reid, Lord Tucker, Lord Keith of Avonholm, and Lord Somervell of Harrow.

For the employers, Mr. I. H. Shearer, Q.C., said it was not disputed that Wardlaw contracted the disease through his work or that the company were at fault because at times the apparatus which extracted the dust caused by the swing grinders became blocked. More dust, however, was produced by the operation of the pneumatic hammers, and no method of absorbing this dust was at present known. He contended that Wardlaw had failed to discharge the onus which lay on him of showing that his illness was caused by dust from the swing grinders rather than from the pneumatic hammers, where the employers had been held not to be at fault. It was not sufficient to prove fault by the employers; Wardlaw must also prove that the fault led to the disease.

Mr. C. W. Graham Guest, Q.C., for Wardlaw, said it was not for him to prove that more dust came from the swing grinders than from the pneumatic hammers, but for the employers to show that there was no connection between their fault in not effectively maintaining the dust extraction plant and Wardlaw's contracting of the disease.

News in Brief

THE Mechanical Handling Exhibition and Convention is to be held at Earls Court, London, from May 9-19.

LIGHT & COMPANY, LIMITED, Poyle Trading Estate, Colnbrook, Bucks, have just issued their 1956 list of organic chemicals.

OVER 100 CHILDREN attended the annual Christmas party organized by the Social and Sports Club of Joseph Sankey & Sons, Limited, Stourport.

THE COUNTY DOWN RAILWAY (now absorbed by the Ulster Transport Authority) recently sold 26 veteran steam locomotives for a total sum of £27,705.

THE Association of British Chemical Manufacturers is organizing the chemical section of the British Industries Fair in the National Hall, Olympia, in the second half of the Fair, from April 23 to May 4.

STANTON IRONWORKS, LIMITED, Ilkeston, announced on January 23 that they had received a £320,000 order from Iraq. It is for a supply of iron pipes and special castings for water-supply schemes throughout the country.

THE 600 GROUP, George Cohen, Sons & Company, Limited, announce that the group has bought the whole of the share capital of Dunlop & Ranken, Limited, constructional engineers and steel stockholders, The Headrow, Leeds.

A NEW BRITISH COMPANY, Bardahl Products, Limited, 9, Watling Court, London, E.C.4, has been formed to market a lubricating oil of this name. Though of American origin it is being manufactured in Norway to overcome the use of dollar currency.

OF THE PERSONNEL of the French foundry industry, six per cent. are college-trained engineers and technicians, seven per cent. office workers, 25 per cent. high-grade or good craftsmen, 38 per cent. tradesmen, 20 per cent. labourers, and four per cent. apprentices.

MIDLAND SILICONES, LIMITED, have announced substantial reductions in the home trade prices of their MS 200 silicone fluids and their Releasil fluids and emulsions. The reductions, varying from 2s. per lb. to 4s. per lb., became effective from January of this year.

THREE WROUGHT-IRON GATES have been given to All Saints' Church, Wilden, Stourport, as a memorial to Capt. Nathaniel and Mrs. Elizabeth Bell Martin by their four children. Captain Martin was formerly general manager of Richard Thomas & Baldwin, Limited.

ACCORDING to Mr. H. Cunliffe, general manager—Industrial Fuels, Shell-Mex and B.P., Limited, speaking at a fuel efficiency conference at Slough, one in four of today's ordinary industrial and commercial coal users will have to change to oil fuel within the next three or four years.

THE Instrument Society of America announces that the eleventh annual Instrument-Automation Conference and Exhibit (International) will be held in New York City from September 17 to 21. Details are available from Mr. Fred J. Tabery, exhibit manager, 250 W. 57th Street, New York.

THE GENERAL ELECTRIC COMPANY, LIMITED, has received an order from Simon-Carves, Limited, for two 8,000-kw double pass-out condensing turbo-alternators. Installation of these sets in the carbonization plant will form part of the modernization which the NCB is effecting at Cwm Colliery in South Wales.

THE FOLLOWING CHANGE OF PROGRAMME has been announced by the secretary of the East Anglian section of the Institute of British Foundrymen. Mr. A. Tipper's paper on the CO_2 Process will be brought forward to the next meeting on February 21, instead of April 17 as originally arranged. The subject for the April 17 meeting will shortly be announced.

IN CONNECTION with the 25th anniversary of the establishment of the Norton Grinding Wheel Company, Limited, at Welwyn Garden City, the company has issued a very attractive brochure. This goes back and gives some notes on the 70-year-old American parent company. All the manufacturing and social activities of the company are well covered.

OVERSEAS CONTRACTS valued at about £750,000 for a new type of gear-cutting machine have been announced by David Brown Machine Tools, Limited, Manchester. Orders for the new machines have come from shipbuilders in Germany, France, and Italy. The German order is for the largest-sized machine capable of producing turbine gears 14½-ft. diameter.

STEEL, PEECH & TOZER, LIMITED, Rotherham, have added an extra story to their traffic offices in order to have accommodation for the largest model ever housed at the works. The model now being built is a scale replica of the firm's internal railway system which covers 50 miles of track. The cost of the model and its accommodation is between £2,000 and £3,000.

AMONG ORDERS received by W. G. Bagnall, Limited, Stafford, is one from the Mysore Iron & Steel Company, Limited, India, for a steam locomotive. Rustenburg Platinum Mines of South Africa has placed an order for two diesel-mechanical locomotives and Railway Mine & Plantation Equipment, Limited, has placed a contract for two locomotives designed for a 3-ft 3¾-in. track.

"ELECTRICITY AND SMOKELESS ZONES" is one of the subjects to be dealt with at the Electrical Development Association's annual conference of Electricity Boards' sales staffs to be held in London from April 10 to 13. The sessions on the first three days will be held at the Caxton Hall, Westminster, and the meeting on the fourth day will be in the Connaught Rooms, Great Queen Street, W.C.2.

ALFRED BULLOWS & SONS, LIMITED, Long Street, Walsall, Staffs, announce that a modified type of cooler is now being fitted to their 40SR.1801 Hydrovane compressor. This is a laminar type of cooler and was first produced to meet the extreme conditions encountered in the tropics. A British Standard motor is fitted on the unit, and the plant is available complete with receiver and all switchgear.

THROUGH its associated company, Associated Electrical Industries (India), Limited, the Metropolitan-Vickers Electrical Company, Limited, has obtained an order from the Punjab Government covering five water-turbine-driven a.c. generators for the first stage of the Bhakra Dam project on the Sutlej River in northern India. Each generator will have an output of 100,000 kva. at 166.7 r.p.m. The order is valued at over £1,000,000.

CONTRIBUTIONS amounting to £35,000 have been received from North-East Coast shipbuilding and marine engineering companies for the establishment of a chair of marine engineering at King's College, Newcastle-upon-Tyne, which is part of Durham University. The council of the college also announces that among the latest subscriptions to its appeal fund, which has reached £300,000, is a donation of £10,000 from the Consett Iron Company, Limited.

Forthcoming Events

FEBRUARY 6

Institute of British Foundrymen

Sheffield and district branch:—Discussion—"Fabrications and Castings." Joint meeting with the Institute of Welding, 6.30 p.m., at the Grand Hotel, Sheffield.

FEBRUARY 7

Institute of Metals

South Wales local section:—"Shell Moulding," by M. C. Dixon, 6.45 p.m., at the Department of Metallurgy, University College, Singleton Park, Swansea. 6 p.m., refreshments in the College Refectory.

FEBRUARY 8

Institute of Industrial Supervisors

Bristol section:—"Human Relations in Industry," by I. E. Baggs, 7.30 p.m., at the Grand Hotel.
Warrington section:—"Motion Study on the Shop Floor," by A. Jones, 7.30 p.m., at the White Hart Hotel.

Incorporated Plant Engineers

Western branch:—"The Factory Act and the Works Engineer," by Miss F. E. Messiter, 7.15 p.m., at the Grand Hotel, Bristol.

National Society of Master Patternmakers

Leicester meeting:—Works visit to Wadkin, Limited.

Institution of Production Engineers

Liverpool section:—"Non-destructive Testing," by J. Johnson, B.SC., 7.30 p.m., at the Exchange Hotel.

FEBRUARY 9

Institute of British Foundrymen

Beds/Herts section:—Technical films, 7.30 p.m., at K. & L. Steelfounders & Engineers, Limited, Letchworth.

Incorporated Plant Engineers

Glasgow branch:—"Engineering Metals," by J. Winning, A.I.M., Albion Motors, Limited, 7 p.m., at Scottish Building Centre, 425/427, Sauchiehall Street.

Institute of Industrial Supervisors

Leeds section:—"The Supervisor and Safety," by R. Liddle, 7.30 p.m., at the Great Northern Hotel.
Nottingham section:—"Supervisor's Place in Management," by D. H. Bramley, 7.30 p.m., at Beeston Boiler Company. (Joint meeting with Beeston Boiler Company's Foremen's Association.)
Smethwick section:—"Industrial Law," by J. D. Dwyer, 7.30 p.m., at the Chance Technical College.

Institution of Production Engineers

"Work Design and Training for Future Industrial Skills," by N. H. Mackworth, M.B., CH.D., PH.D., commencing with tea at 5.30 p.m., at the Royal Institution, Albemarle Street, London, W.1.

FEBRUARY 9

Institute of British Foundrymen

Lancashire branch:—"Simple Foundry Expedients Proved Worthwhile in Recent Years," by J. E. O. Little, 3 p.m., at the Midland Hotel, Manchester.
Lincolnshire branch:—"Jobbing Work in the Foundry," by E. Clipson, 7.15 p.m., at the Technical College, Lincoln.
Burnley section:—"Shell-moulding Foundry," by J. E. Worthington, 7.30 p.m., at the Accrington College of Further Education, Sandy Lane.

FEBRUARY 10

Institute of British Foundrymen

Tees-side branch:—"Foundry Problems and Principles," by G. J. Rogers, 7.30 p.m., in the Teesdale Hall, Head, Wrightson & Company, Limited, Thornaby-on-Tees.

FEBRUARY 11

Institute of British Foundrymen

Newcastle and district branch:—"Cupola Practice," by W. Y. Buchanan, 6 p.m., in the Neville Hall, Westgate Road, Newcastle-upon-Tyne.
Scottish branch:—"Scrap Investigation," by John McGrandle, 3 p.m., at the Royal Technical College, George Street, Glasgow.

Mr. W. N. TURNER, London and district representative of H. W. Lindop & Sons, Limited, malleable ironfounders, Walsall, for 40 years, died on January 12.

Personal

MR. S. W. MILLS and MR. E. H. TWAITS have been appointed executive directors of the Plessey Company, Limited.

MR. LEONARD C. MILLER, director and works manager of Merryweather & Sons, Limited, of Greenwich, retired on January 31 after 47 years with the firm.

Cmdr. (E) J. B. MATTEI, RN (Rtd.), has been appointed Middle East representative of Associated British Engineering, Limited, and its constituent companies.

MR. A. J. PEECH, deputy managing director of the United Steel Companies, Limited, has accepted an invitation to join the board of the Butterley Company, Limited.

Mr. DAVID E. TERRY, who last year was elected a director of Herbert Terry & Sons, Limited, springmakers, of Redditch (Worcs), has been appointed sales director of the company.

MR. JAMES R. A. BULL, managing director of Sanderson Brothers & Newbould, Limited, has been appointed chairman of the company. He succeeds MR. J. H. BROWN who recently retired from the board.

Mr. ERIC FALKINGHAM has been appointed group secretary to Hathorn Davey & Company, Limited, engineers and pump manufacturers, Sun Foundry, Leeds.

Mr. R. CONNOR has retired from the board of Parkinson & Cowan, Limited, through ill-health, after 27 years' service with the group. Sir GEOFFREY VICKERS and Mr. G. J. CUTBUSH have been appointed directors.

MR. A. R. RUMFITT has been appointed sales manager of the Yorkshire Switchgear & Engineering Company, Limited, Leeds. He has been technical manager since 1950, having previously served under the Yorkshire Division of the Central Electricity Authority.

A presentation has been made to Mr. G. G. IBBOTSON, general manager of the heavy constructional division erection department of Newton, Chambers & Company, Limited, who is to retire at the end of this month. Mr. Ibbotson has been with the company for 44 years, while his father served at Thorncliffe for 53 years.

The Development and Research Department of the Mond Nickel Company, Limited, announce the following appointments: MR. G. L. HARRISON, A.I.M., will succeed Mr. A. D. Busby as a development metallurgist in London, where he will be working in the cast iron field; MR. P. D. WILMOT, B.SC., will join the company on March 1 as a development chemist; and MR. J. H. GITTUS has been appointed section leader of the cast iron section of the Development and Research Department laboratory, as from March 1. His previous experience has been with the British Cast Iron Research Association.

MR. WALTER WEST has been appointed deputy managing director of Leyland Motors, Limited. Formerly assistant managing director of the company, he has been a member of the board since 1946, and managing director of the subsidiary company, West Yorkshire Foundries, Limited, for an equal number of years. Born in Darlington, Mr. West served his apprenticeship with the Darlington Forge Company, Limited, now the English Steel Corporation, after which he joined Dr. J. Newton Friend in Birmingham, and devoted several years to a specialized study on the production of non-corrosive and heat-resisting steel.